Ex Vivo Repair and Renal Autotransplantations for Reno-Vascular Disease

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Ex Vivo Repair and Renal Autotransplantations for Reno-Vascular Disease

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Abstract

Ex vivo repairs and renal autotransplantations were performed in three cases of renovascular disease. The first 2 cases consisted of stenosis of renal artery, one due to TAKAYASU's disease and the other due to atherosclerosis. The third case was an aneurysm of renal artery. In all three cases ex vivo repaires of renal arteries, coupled with renal autotransplantations to ipsilateral iliac fossa were performed with satisfactory results.

Introduction

Renal transplantation is considered as one of the popular surgical procedures recently. The safety and sureness of the operative procedures have been well established. For one year of 1983, more than 6000 renal transplantations were performed in the U.S.A.[1], and more than 500 in Japan[2].

And this technique allows us to repaire the renovascular lesions which have been considered to be difficult or impossible to correct by a conventional in situ operation.

In 1962 HARDY made the first successful autotransplantation of the kidney to illiac fossa for repair of the demaged ureter[3] and in 1967 OTA used this method for the treatment of renovascular hypertension[4].

Herein two cases of renovascular hypertension and a case of an aneurysm of renal artery are presented.

Materials

From July '74 to June '86 in 2nd surgical department of Nagoya University Hospital, two

Key words: Ex vivo repair, Renovascular hypertension, Takayasu's disease, Aneurysm, Renal autotransplantation.
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cases of renovascular hypertension and a case of aneurysma on the first bifurcation of the left renal artery, were decided to have surgical corrections of renal arterial lesions by means of ex vivo repair and renal autotransplantation.

All three cases are married middle aged females. In each 3 cases the repair in situ was very difficult not only technically but also theoretically and was considered to have relative or absolute indication for ex vivo repair.

Operative Method

Under general anestesia, a long oblique abdominal incision is made over the affected kidney after BERGMANN-Israel, to enter the retroperitoneal space without entering the abdominal cavity. After exposure of the kidney of the affected side with careful blunt and sharp dissections around the renal capsel, the renal artery and vein are exposed, clamped and severed from the aorta and vena cava, respectively. Then the kidney is placed outside of the incision without disturbing the continuity of the ureter and is irrigated immediately with ice cold lactated RINGER's solution or COLLIN's buffer solution with heparin, concentration of 5000 units/litter through the artery with pressure about 100 cm water until the solution returning from the vein becomes completely clear.

The clamped renal artery and vein are doubly ligated, just distally from the aorta and vena cava, respectively.

After satisfactory correction or repair or partial resection of renal arterial lesion, ipsilateral iliac fossa is prepared and the internal iliac artery and common iliac vein are dissected and prepared for anastomosis. Then the kidney is placed in the iliac fossa, up side down, avoiding kinkings of the ureter. The renal artery is anastomosed to internal iliac artery, end to end and the renal vein to the common iliac vein, end to side, with continuous stiches of 5-0 nylon and Fig. 1 is the simplified illustration of completion of the operation. Hemostasis is checked and penrose drains are placed to the retroperitoneal space where the affected kidney has been sitting in. The would is closed by layers.

Case #1. A 35 year old female, Y M. whose hypertension had been noticed 12 years before this admission, when she had pregnant in the first time, had been complaining of occasional headache, vertigo and numbness of the left arm. A couple of years before this admission, those symptoms being worsened, anti-hypertensive drugs had been administered with poor effect. Her systolic blood pressure in those days was about 200 mmHg. One month before this admission, accidentally she had been disclosed the normo-or hypo-tension in the left branchial artery. She was admitted to Nagoya university's hospital on 27 August '74 for further examination and evaluation of the stenosis of left subclavian artery.

She had a history of pleuritis at the age of 10, and appendectomy at the age of 32.

Physical:

In physical examination, a 35 year old, none acutely ill apearanced, 2 para, 2 gravida, 0 miscarriage, female with 146 cm in height and 43 kg in weight was revealed out blood pressure 188/70 mmHg and 114/72 mmHg, in right and left brachial arteries, respectively. Pulse was

Fig. 1. A scheme of the renal autotransplantation with continuity of the ureter. See the position of kidney up side down.

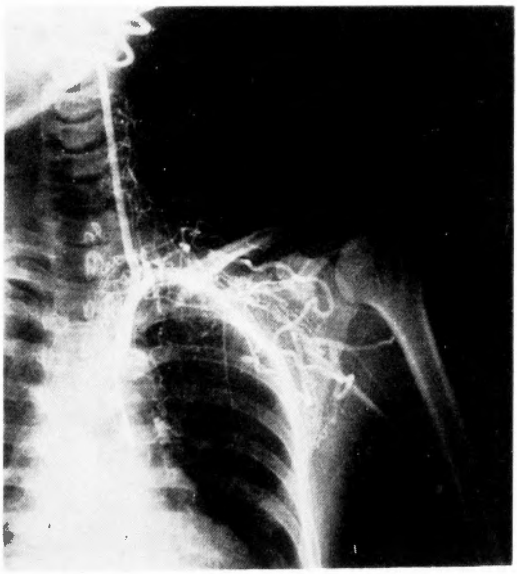

Fig. 2. Pan-aortogram of case #1 showes the complete obstruction of left subclavian artery with well developed collaterals.

Table 1. Split renal fuction test was obtained by insertion of a catheter into left ureter, and the data suggests us the renal arterial stenosis of right side.

	right	left	meaning
Na	69 mEq/l	132	rt. 52% ↓
Crea	46	28	rt. 164% ↑
K	21	15	rt. ↑
Cl	73	138	rt. ↓

74. No other abnormal findings were disclosed.

Laboratory findings:

Complete blood cell count, routine blood chemistry, and general urinalysis were all normal.

Hospital course:

Angiography, as shown in Fig. 2, revealed the obstruction of left subclavian artery with well developed collaterals, a segmental narrowing of the abdominal aorta and stenosis of right renal artery, which were compatible to TAKAYASU's disease. Dripping intravenous pyelography with mannitol washing out test showed some delay of dye-excretion in right side kidney. A split renal function test, HOWARD-REPAPART's test which was obtained by catheterization to the left ureter, showed certain laterality, indicated the presence of the stenosis of right renal artery, as shown in Table 1.

Serum renin activity in periphral vein was abnormally high, 1500 ng/dl (normal : less than 100 ng/dl).

Under the diagnosis of renovascular hypertension, renal autotransplantation to ipsilateral iliac fossa was scheduled, instead of simple aorto-renal bypass graft because of the narrowing of

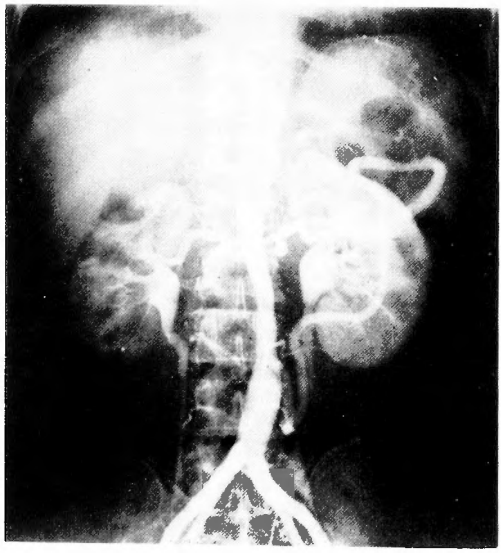

Fig. 3. Aortogram of case #1 showes the segmental narrowing of the abdominal aorta and stenosis of the right renal artery.

the whole segment of abdominal aorta, secondary due to TAKAYASU's disease, as shown in Fig. 3. The operation was done on September 9 '74 and the postoperative course was uneventful and normalization of blood pressure was obtained within 2 days after operation. Serum renin activity went down to 340 ng/dl on 1st postoperative day and 436 ng/dl on 2nd postoperative day.

She was discharged in 2 weeks after the operation with stable normal leveled blood pressure.

She has been in normotensive around 120/70 mmHg for eleven years after operation, without taking any antihypertensive drugs.

Case #2 A 45 year old married female, M. M. entered the national hospital because of anterior chest pain on April 8 '85. Under the diagnosis of acute myocardial infarction, coronary angiography was done and disclosed 90% stenosis of the right coronary artery and 50% stenosis of the circumflex artery and in the same time stenosis of the root of right renal artery was revealed out in aortogram, as shown in Fig. 4. She had been suffered from hypertension for years and occationally her blood pressure had gone up to more than 200 mmHg in systolic. She was transfered to the University Hospital on July 25 '85 for a surgical treatment of renovascular hypertension.

She had a history of appendectomy at age 14.

Physical:

A 45 year old, none acutely ill appearanced small woman with 146 cm in height and 36 Kg in weight was disclosed blood pressure 156/80 mmHg, pulse 60 and otherwise no abnormal findings.

Laboratory findings:

Results of laboratory studies, including urinalysis, complete blood count, and liver function tests were all within normal limits. Values for serum Na, K, Cl, BUN and creatinine were 135, 4.5, 100, 18 and 1.2, respectively. The values of serum renin activity in the peripheral vein, right and left veins were 266, 456 and 247 ng/dl, respectively.

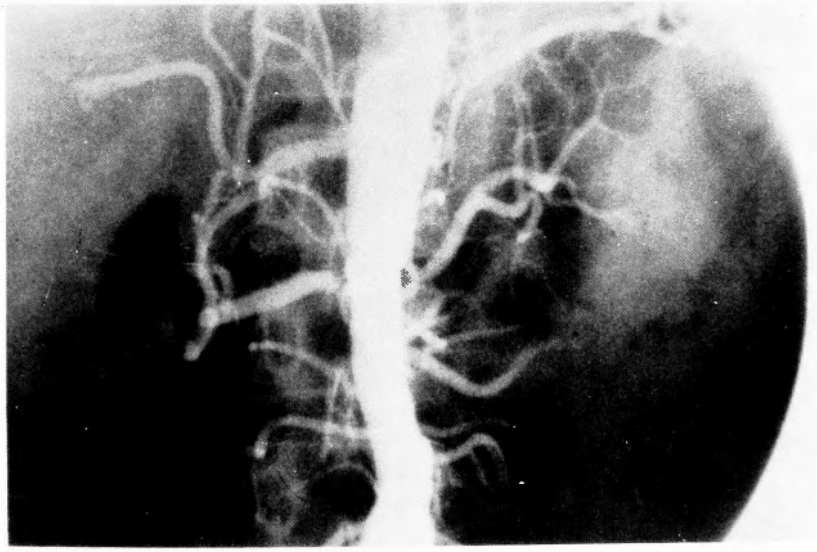

Fig. 4. Aortogram of case #2, showing the stenosis of the right renal artery.

Hospital course:

On August 7 '85 removal of the stenotic segment of the right renal artery, followed by renal autotransplantation was performed. The values of serum renin activity in the peripheral veins on 1st, 5th, 10th and 24th post-operative day were 398, 181, 266 and 116 ng/dl, respectively. Normotension was obtained within 2 days after operation and had been maintained fairly well. Slight elevation of GOT and GPT, which had been noticed in several days after the operation, were normalized by itself and she was discharged on 37th post-operative day with good condition.

Case #3 A 44 year old female, F. Y., was admitted to the hospital because of gross hematuria. She had a long history of occational hematuria 8 years prior to this admission and in each time it ceased by itself in a few days without having signs and symptoms of cystitis. Six months prior to this admission she had been hit on the lt. back over the left renal area and the frequency of the episodes of gross hematuria increased. Three months before to this admission a lot of blood clot was noticed in her morning urine and came up to the hospital to have intravenous pyelography which showed the some alteration of the shape of left renal pelvis, as showed in Fig. 5. A selective left renal arteriography disclosed a 1.5 cm diameter round aneurysma on the portion of first bifurcation, of the renal artery, as shown Fig. 6. She was admitted on March 6 '86 for the operative treatment of it.

Physical:

She was a 44 year old non acutely ill appearanced 2-para, 2 gravida, well nourished woman with 158 cm in height and 56 Kg in weight, blood pressure 130/90 mmHg, pulse 78. Essencially

Fig. 5. Dripping intravenous pyelogram of case #3 shows a deformity of the left renal pelvis.

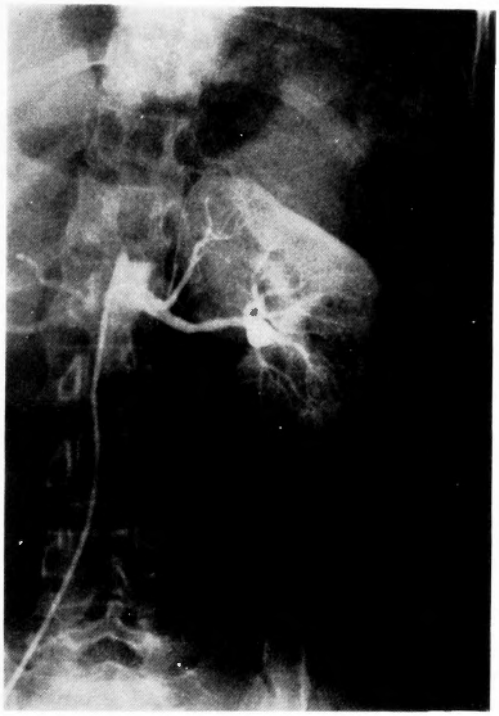

Fig. 6. Selective left renal arteriogram of case #3 indicated a 1.5 cm diameter aneurysma, located on the bifurcation of right renal artery.

no other abnormal findings were demonstrated except the scars in the lower abdomen, one for appendectomy at the age 31 and the others for CAESARIAN's sections at the age of 23 and 25. No other notable past histories were mentioned.

Laboratory findings:

Hb 10.5 gm/dl, Ht 39.6%, RBC401×10⁴, WBC4800, Plt241000, blood chemistry were all normal including BUN, creatinine and electrolytes. Value of creatinine clearance was 101 ml/min and that of PSP at 15, 30, 60 and 120 minutes were 28, 12.3, 11.9 and 8.8% respectively. Hospi

On March 10 '86 the aneurysma of left renal artery was removed by ex vivo surgery and autotransplantation of the repaired kidney was performed. Post operative course was quite smooth. The value of creatinine clearance was 82.5 ml/min on 7th post operative day. The follow-up arteriography are shown in Fig. 7. She was discharged on 27th post-operative day.

Results:

In case #1, pre-operative symptomes, such as headache, heaviness of shoulders and dizziness were all completely disappeared and she has been well for these 12 years with normal blood pressure.

In case #2, slightly elevated GOT and GPT, just after the operation, were all completely normalized in a couple of months after the operation. She has been doing well for these 16 months.

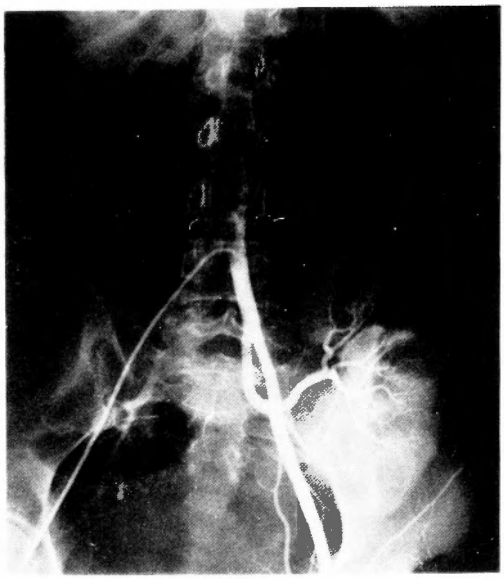

Fig. 7. Post-operative angiography of case #3.

In case #3, her post operative course was non-eventful and no more hematuria has been noticed any more even in microscopic examinations for these 11 months.

Discussion

It has been mentioned that 95% of hypertensives are essential hypertension which are out of surgical treatment but the other 5% of them are curable form of hypertensives, such as renovascular hypertension, primary hyperaldosteronism, coarctation of the aorta and CUSHING's disease[5].

Surgical correction of renovascular hypertension had not been so impressive results, as indicated by SHAPIRO in a study of 115 cases in 1969[6] and by STARR in a longterm follow-up of 216 patients in 1980[7]. And in those days, nephrectomy had been considered to be the best treatment to obtain normotension. But current results of bypass operation for the treatment of renovascular hypertension showed operative mortality rates of less than one per cent and early patency of revascularization in excess of 95 per cent. But failure rate within one month and late development of aneurysma or stenosis were not negligible, as high as 23% and 12%, respectively. in R. H. DEAN's report[9].

According to the report of 100 aortorenal vein graftsby J. C. STANLEY, trouble occured in 45 cases, including stenosis and aneurysmal dilatations[9].

On the other hand, ex vivo repair and autotransplantation of the kidney was first made by Hardy in 1963[1] and was followed by WOODRUFF in 1964[10] and OTA in 1967[2] for the treatment of renovascular hypertension. Thereafter many succesful reports were made[11~19].

The data are shown in Table 2. The superiority of this procedure to the conventional in situ operations, in the points of certainty and safety, is clearly shown.

Table 2. RVH: renovascular hypertension "Failure" means operative failure, such as development of thrombosis, stenosis, or aneurysma, including nephrectomy. The case, not obtaining real normotension is not counted.

Name of reporter	number of case & name of disease	Number of fail
Lim, R. C. et al[11] ('72)	3 : 1 hilar injury of a solitary kidney	0
	2 RVH	0
Stessman et al[12] ('80)	1 RVH	0
Novic et al[13] ('80)	67 : 8 ureter injuries	0
	2 urinary undiversions	2
	10 RVH	0
	3 Carcinoma solitary kidney	0
	1 Renal calculi	0
	43 Operative repair transplantation	0
Goes et al[14] ('81)	15 RVH	1
Kumazaaw et al[15] ('83)	3 RVH	0
Takaha et al[16] ('84)	21 : 20 RVH	0
	1 Ureteral tumor	0
Masuda et al[17] ('84)	3 Aneurysma	0
Hirano et al[18] (84)	5 : 2 RVH	0
	3 Renal calculi	0
Dubernard et al[19] ('85)	24 : 14 RVH	1
	10 Aneurysma	1
Ito et al ('86)	3 : 2 RVH	0
	1 Aneurysma	0

For the operative indications concern, this procedure is thought effective for patients with renovascular hypertension, of which angioplasty is considered very difficult to do by a conventional in situ procedure or especially when the prior repair, in situ was unsuccessful. Stenosis of the renal aretry in child is also a good candidate for this operation[21]. Recurrent renal calculi[13,18] carcinoma of a solitary kidney[13], ureter injuries[1,13], vascural lesions in solitary kidney[20], aneurysma, involving branches of renal artery[17,19], ureter tumor[16] are considered to have indications for this procedure.

Extracorporeal surgery, coupled with autotransplantation has advatages to have optimum exposure, under bloodless surgical field with greater protection of the kidney from ischemia, more facile use of microvascular techniques and optical magnification. This cperative technique warrants widespread application in various kinds of renal disease.

The abstract of this paper was read and discussed before the meeting of 217th Tokai Surgical Society in Nagoya on May 18th '86.

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和文抄録

腎自家移植術を利用した腎動脈病変の治療

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鵜飼　光雄

腎動脈に，外科治療の対象となる病変を持つ三症例に対し，腎自家移植術を行い治療した．腎血管性高血圧症の二例，一例は高安氏病により，他の一例はアテロームにより腎動脈の狭窄を来たしているものであった．他の一例は，血尿を主訴とした腎動脈の動脈瘤であった．治療はいずれも，患側の腎動・静脈を切断し体外に取り出し，0°C のリンゲル液で灌流した后，各々の血管病変を切除，修復后，同側の腸骨窩に腎臓を移し，腎動脈を内腸骨動脈と，腎静脈を総腸骨動脈と吻合した．三例共に満足すべき結果を得た（最長12年間）．腎移植術の手術手技が確立した今，腎血管病変の治療に，腎自家移植術が大いに利用されるべきと考えられる．